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nauk, red.; STEPANCHENKO, N.S., red.izd-va; EL'KIND, V.D.,
tekhn.red.

[Metal soldering] Paika metallov. Moskva, Gos.nauchno-tekhn.
lit-ry, 1959. 177 p. (MIRA 12:11)
(Solder and soldering)

LASHKO-AVAKYAN, S.V.

25(1)

PHASE I BOOK EXPLOITATION

SOV/2212

Lashko, Nikolay Fedorovich, and Sof'ya Vasil'yevna Lashko-Avakyan

Payka metallov (Brazing and Soldering of Metals) Moscow, Mashgiz, 1959. 442 p.
10,000 copies printed.

Ed.: S. L. Martens, Engineer; Tech. Eds.: A.F. Uvarova and V.D. El'kind;
Managing Ed. for Literature on Heavy Machine Building (Mashgiz): S. Ya.
Golovin, Engineer.

PURPOSE: This book is intended for scientists, engineers, and technicians concerned with the development and application of metal soldering in the machine-building industry.

COVERAGE: The authors discuss the basic physical and chemical processes and structural transformations occurring during metal soldering and brazing, the constructional characteristics of soldered joints, and the preparation of parts for soldering. They also give information on fluxes and solders and describe methods for manual and mechanized soldering of alloys of different bases. No personalities are mentioned. References follow each chapter.

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Brazing and Soldering of Metals (Cont.)

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SOV/135-59-6-6/20

18(7)

AUTHOR: Lashko-Avakyan, S. V., and Lashko, N. F., Candidates
of Technical Sciences

TITLE: Problems in Alloying Welded Strained Aluminum Alloys

PERIODICAL: Svarochnoye Proizvodstvo, 1959, Nr 6, pp 19-23 (USSR)

ABSTRACT: For a long time aluminum-alloys have been used for welded products, with a comparatively small tendency to fissure-forming, producing plastic, weld seams. The alloys were AD-1, AMts, AMg-3. The article re-presents new sorts: AMg-6T, D20, M40, which are different from DK6, AK6, AK8, B95, according to their structure. The article discusses - from the point of view of improving their weldings - welded strained aluminum alloys used in the welding industry, such as AMts AV, AMg, Ah6, AK8, D16, V 95. These alloys contain almost all technical systems of aluminum alloys: Al-Mn, Al-Mg, Al-Mg-Si, Al-Mg-Si-Cu, Al-Cu-Mg, Al-Zn-Mg, Al-Zn-Mg-Cu. Single sorts of aluminum are examined separately: technical aluminum, AMts-alloys, Al-Mg-alloys, AB-alloys,

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SOV/135-59-6-6/20

Problems in Alloying Welded Strained Aluminum Alloys

AK (AK 6, AK 8) alloys, Duraluminum D1 and D16, alloy B 95. There are 5 graphs, 1 photograph, 1 table, 1 diagram and 4 references, 3 of which are Soviet and 1 German.

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S/137/61/000/002/016/046
A006/A001

Translation from: Referativnyy zhurnal, Metallurgiya, 1961, No. 2, p. 9 # 2E69

AUTHORS: Lashko-Avakyan, S.V., Lashko, N.F.

TITLE: On the Weldability of Aluminum Alloys

PERIODICAL: "Tr. Nauchno-tekhn. o-va sudostroitel. prom-sti", 1959, No. 33, pp. 3 - 19

TEXT: The authors analyze the mechanism of hot crack formation during the welding of Al-alloys of the systems: Al-Cu; Al-Cu-Mg; Al-Mg; Al-Mg-Si; Al-Zn-Mg and Al-Zn-Mg-Cu. Problems of chemical heterogeneity and means of modifying weld joints are discussed; methods of preventing hot crack formation are recommended. There are 16 references.

Yu. S.

Translator's note: This is the full translation of the original Russian abstract.

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STEPANOV, Sergey Ivanovich; LASHKO, S.V., kand.tekhn.nauk, retsenzent;
SOBOLEVA, G.N., izdat.red.; GORDEYEVA, L.P., tekhn.red.

[Forging parts from scrap metal] Shtampovka detalei iz metalli-
cheskoi stryzhki. Moskva, Gos.nauchno-tekhn.izd-vo mashinostroit.
lit-ry, 1960. 36 p. (MIRA 14:2)
(Forging) (Scrap metals)

LASHKO-AVAKYAN, S.V.

PHASE I BOOK EXPLOITATION SOV/4270

Lashko, Nikolay Fedorovich, and Sof'ya Vasil'yevna Lashko-Avakyan

Svarivayemye legkiye splavy (Weldable Light-Metal Alloys) Leningrad, Sudpromgiz, 1960. 439 p. Errata slip inserted. 3,400 copies printed.

Scientific Ed.: G.L. Petrov; Ed.: Yu. S. Kazarov; Tech. Ed.: R.K. Tsai.

PURPOSE: The book is intended for scientific and technical personnel engaged in research, development, and use of weldable light-metal alloys.

COVERAGE: The book contains results of investigations of the structure of welded joints and the causes and prevention of hot cracking. Basic characteristics are given of industrial alloys and recently developed aluminum-, magnesium-, and titanium-base alloys. An analysis of the weldability of these alloys is also presented. Conditions for making high-grade welds are discussed. No personalities are mentioned. References accompany each part.

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18(7)

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SOV/125-60-1-4/18

AUTHOR: Lashko-Avakyan, S.V. and Lashko, N.F. (Moscow)

TITLE: Crystallization Cracks Near Weld Seams

PERIODICAL: Avtomaticheskaya svarka, 1960, Nr 1, pp 27-37
(USSR)

ABSTRACT: The peculiarities and probable processes of crack formation near weld seams, mainly in aluminum alloys, ¹⁸ are discussed. Data from existing works [Ref 1-9] ²¹ as well as experimental evidence are presented in support of the inferences drawn. Macro and microphotographs of seams in steel and aluminum alloys are given. The nature of near-weld crystallization cracks is attributed to the formation (not growth) processes of metal grains, observed experimentally with the VIM-1M microscope, in the base metal at the seam. It is concluded that the tendency to form cracks can be diminished by rapid heating of the base metal to melting point, by producing a small zone of partial melting, and by any ⁴

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Crystallization Cracks Near Weld Seams

means conducive to the formation of a fine grain structure in the base metal near the weld. The following filler metals prevent cracking in and near the weld during the welding of duraluminum: "AK" (4.5-6% Si; the rest aluminum); "B61" (6-7% Cu; 2-2.5% Ni; 1.2-1.6% Mg; 0.4% Mn; 0.25--.35% Ti; the rest aluminum). These filler metals form more easily fusible alloys in the seams. There are 7 photographs, 4 graphs and 9 references, of which 8 are Soviet and 1 English. ✓

SUBMITTED: July 2, 1959

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S/135/61/000/003/004/014
A006/A001

AUTHORS: Lashko, N. F., Lashko-Avakyan, S. V., Candidates of Technical Sciences

TITLE: On the Selection of Brazing Temperature

PERIODICAL: Svarochnoye proizvodstvo, 1961, No. 3, pp. 11-14

TEXT: There was until the present no founded theoretical basis for selecting the proper brazing temperature assuring high quality of the brazed joints. The authors investigate temperature conditions of capillary brazing, and reject the method based merely on the knowledge of the properties of the solder, as not sufficiently accurate. Depending on the nature of the contacting liquid solder and the alloy to be brazed, the temperature and duration of the contact, the brazed metal undergoes a more or less intensive diffusion in the solder (erosion). The properties of joints produced by capillary brazing are determined by the nature of the physico-chemical interaction of the liquid solder and the brazed metal, the temperature and duration of the interaction and by the capacity of the liquid phase of filling the capillary interspaces. The minimum brazing temperature must assure the filling of capillary interspaces and a satisfactory adhesion of the solder with the base metal. It must be equal to or above the temperature

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On the Selection of Brazing Temperature

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of transition into the liquid-solid phase of the alloy formed in the gap, since the flowing of the solder into the gap can be assured only at this temperature. From this point of view, the brazing temperature must be selected according to the liquid-solid temperature range of the alloy formed in the capillary (Fig. 2). In practice, however, the necessity arises to conduct the process at elevated temperatures and for an extended period of time, as e. g. in stepped and furnace brazing; when combining brazing and heat treatment of the joint; in gas flux brazing etc. On the basis of data obtained with specimens shown in Figure 2, the spreading of the solder and its interaction with the base metal at elevated temperatures can to a first approximation be divided into the following three stages: 1) weak interaction of the liquid solder with the base metal and frontal motion of the solder over the surface; 2) intensified interaction and ramified motion; 3) intensified interaction and frontal motion. These 3 stages are illustrated in Figure 3. They were observed in furnace brazing in a vacuum of some austenitic bi-phase steels with solders on Ni-Mn-Cr and Ni-Si-P-Cr base (Fig. 4). When using solders that form eutectics with the base metal, the intensified diffusion of the base metal is promoted 1) by a great difference between the melting temperature of the brazed metal and eutectics, since the contact of the metal and the liquid phase is prolonged; 2) high solubility of the base metal

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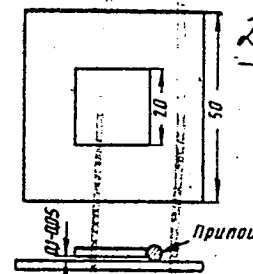
On the Selection of Brazing Temperature

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A006/A001

in the liquid solder; 3) high content of the brazed alloy base in the eutectics. The joint effect of these factors on erosion of the brazed metal can be observed when brazing aluminum with lead, zinc and nickel with Ni-B and Ni-P base solders (Table 2). The formation of eutectics in the soldered joint is preceded by a diffusion process between the solder and the braze alloy. Therefore the presence of an element in the alloy forming eutectics with the solder, accelerates the formation of a liquid phase and consequently, promotes intensified erosion of the base metal. Spreading of the solder over the brazed metal is reduced when the solubility of the base metal in the solder is raised. The maximum temperature of brazing is found to be that temperature, above which erosion of the brazed joint and processes of reactive diffusion of the I and II order take place, strongly degrading the quality of the joint. The time-temperature dependence shown in graph 6, should be used as a basis when selecting time and temperature conditions for brazing.

Figure 2:

Schematic drawing of a specimen for determining the flowing of solder into the capillary gap (0.05 - 0.1 mm) between 60 x 60 and 30 x 30 mm plates



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On the Selection of Brazing Temperature

Figure 3:



$$T_1 < T_2 < T_3 < T_4 < T_5$$

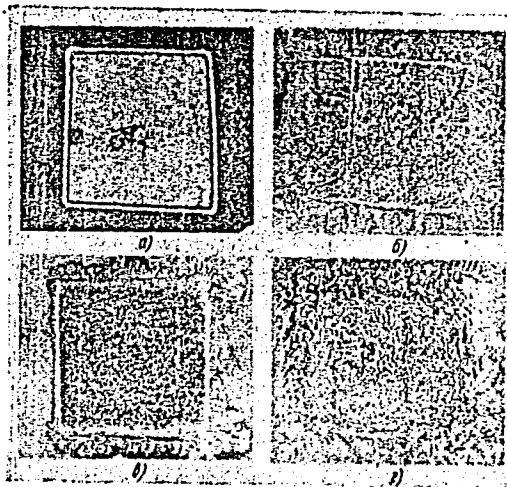
Fig. 3

Figure 3:

Schematic representation of three stages of spreading and interaction of the solder with the material to be brazed in the active area a - weak interaction of the liquid solder with the base material; frontal motion over the surface; b) intensified interaction and ramified motion c) intensified interaction and frontal motion

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Figure 4:



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On the Selection of Brazing Temperature

Figure 4:

General view of specimens showing the flowing of the solder into the gap after vacuum brazing (10^{-2} mm Hg) at different temperatures: a) $1,180^{\circ}\text{C}$; b) $1,220^{\circ}\text{C}$; c) $1,250^{\circ}\text{C}$; d) $1,280^{\circ}\text{C}$. Base metal: stainless bi-phase steel; Ni-Cr-Si-P base solder.

Table 2:

Metal to be brazed	Solder	Temperature in $^{\circ}\text{C}$		Maximum diffusion of the base metal in the solder	Content of base metal in eutectics	Intensity of erosion
		$T_m - T_e$ ($T_m - T_e$)	$T_n - T_e$ ($T_n - T_e$)			
Al	Zn	280	39	1	5	Medium
Al	Sn	431	3	0	0.5	None
Al	Al-Si (eutectic)	83	0	1.65	88.3	"
Ni	Ni-B (eutectic)	312	0	0	96	Strong
Ni	Ni-P (eutectic)	572	0	0	89	"

*) T_m , T_n , T_e - melting temperature of the metal to be brazed, solder, eutectics, respectively.

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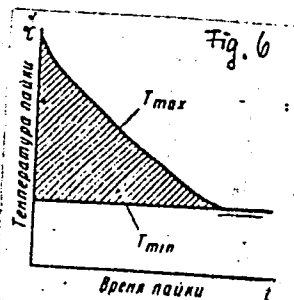
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On the Selection of Brazing Temperature

Figure 6:

Dependence of the temperature range of brazing on the brazing time Area of conditions assuring high quality joints is crosshatched. There are 3 tables, 6 figures and 6 references: 1 Soviet, 2 English, 2 German and 1 French.

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S/135/61/000/004/011/012
A006/A101

AUTHORS: Lashko, N. F., Lashko-Avakyan, S. V., Candidates of Technical Sciences

TITLE: The Scientifico-Technical Conference on the Brazing of Metals

PERIODICAL: Svarochnoye proizvodstvo, 1961, No. 4, pp. 41 - 42

TEXT: The scientifico-technical Conference on the brazing of metals was convened in Moscow from December 15 - 16, 1960 by the welding department of TsP NTO MASHPROM. The opening report was delivered by Professor A. A. Alov, Doctor of Technical Sciences. The conference then heard the following reports: S. N. Lotsmanov, Candidate of Technical Sciences on the present state and problems of brazing; N. F. Lashko and S. V. Lashko-Avakyan, Candidates of Technical Sciences, on "The Theory of Selecting Temperature Conditions of Capillary Brazing"; V. P. Prolov, Candidate of Technical Sciences, on "Considering Temperature Factors and Their Correlation when Planning Soldered Joints and Evaluating the Degree of Softening of Aluminum Alloys During Brazing"; A. I. Gubin, N. F. Lashko, S. V. Lashko-Avakyan, Candidates of Technical Sciences and Engineer V. V. Orlova on the use and development of self-fluxing solders for brazing composite stainless steel

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The Scientifico-Technical Conference on the Brazing of Metals

articles; I. I. Il'yevskiy and N. N. Sirchenko, engineers on the effect of liquid solders on the proneness to brittle failure of stainless steels; V. A. Yekatova, engineer, and A. S. Medvedev, Candidate of Technical Sciences, on brazing with low-melting solders; V. A. Yermolov, engineer, on the technology of brazing with high-temperature solders used for soldering steels and bronzes; I. K. Sklyarov, engineer on brazing titanium and its alloys; A. V. Shavkunov, engineer, on the research of new active gas fluxes and on the use of ammonium fluoride as an active gaseous medium; I. I. Yanovskiy, V. A. Morozov and V. N. Artsimovich, engineers, on the development of new brazing methods for hard-alloy mining instruments; G. S. Keylin, engineer, on the development of new brazing methods for medical instruments; Ya.M. Kanevskiy, Candidate of Technical Sciences, on new methods of abrasive fluxless brazing of aluminum and its alloys with low-melting solders. The Conference decided the organization of a special institute of brazing and of yearly meetings.

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AUTHORS: Lashko-Avakyan, S. V., Lashko, N. E., Candidates of Technical Sciences

TITLE: Corrosion resistance of aluminum alloy joints brazed with low melting solders

PERIODICAL: Svarochnoye proizvodstvo, no. 5, 1961, 13 - 16

TEXT: Problems on the corrosion resistance of joints of aluminum and its alloys brazed with low-melting solders, were until the present not sufficiently studied. When analyzing corrosion processes it is important to establish anodic and cathodic areas in the soldered joint. For this purpose some experiments were made with AMu (AMts) alloys which were brazed with stannous solders alloyed with zinc, lead, antimony and cadmium. Electrode potentials were determined on the Raps potentiometer by A. T. Shibadeyeva. The composition of the solders investigated are given in table 1. An electrolyte of 0.01N NaCl solution was employed. The results obtained show that tin alloys with lead, copper, cadmium and antimony have more positive potentials than the AMts alloys and represent the cathode in the "solder-AMts alloy" pair. Tin alloys and alloys of lead with tin, containing 10% and more zinc, and zinc alloys with aluminum show more negative

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Corrosion resistance of aluminum alloy ...

electrode potentials than the AMts alloy and are the anodes in the "solder-AMts alloy" pair. Analyses of various cases of corrosion failure of aluminum alloy joints brazed with low-melting solders show that the substantial effect is exerted by processes of crevice corrosion (Ref. 1 - 6). Intensive development of crevice corrosion in structures takes place as a result of inhibited diffusion exchange of elements in electrolytes surrounding the structure, in its crevices and gaps. This is due to the presence of peculiar interrupted "bridges" developed during brazing. (Fig. 2) The peculiarities of crevice corrosion in aluminum alloys were investigated on AMts alloys brazed with Sn - Zn solders, and tested in 3% NaCl + 0.1% H₂O₂. Proneness to crevice corrosion was observed in AMts alloys brazed with solders which are not noticeable soluble in aluminum, i. e., the solder systems: Sn-Pb; Sn-Cd; Sn-Al; Cd-Zn, (at relatively low Zn content) and Sn-Sb. The low mutual solubility of these alloys with the AMts alloy and the low soldering temperature do not promote the formation of a strong and tight joint. Gaps between the base metal and the solder in the joint and the joint-adjacent zone are the source of crevice corrosion. In joints brazed with solders containing considerable amounts of zinc (Sn-Zn; Sn-Zn-Al; Zn-Al systems) where strong and tight joints between the solder and the brazed metal are produced, crevice corrosion was not revealed. This proves that crevice corrosion depends mainly on the zinc content in the low melting solders. Corrosion

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Corrosion resistance of aluminum alloy...

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tests were conducted by V. A. Klimova. Great losses of strength as a result of corrosion were revealed in specimens soldered with П 150А (P150A) solder, (containing 38.5% Sn, 57.7% Cu and 3.8% Zn), П 170А (P170A) (75% Sn, 20% Cd and 1% Ag) and П 200А (P200A) (90% Sn, 10% Zn). In specimens brazed with П 250А (P250A) solder (80% Sn, 20% Zn) and protected by varnish coatings, strength losses were not observed. Specimens brazed with П 300А (P300A) (60% Zn, 40% Cd) solder did not change in strength after 4 months tests in tropic atmosphere chambers and during 9-months open air tests. Greatest corrosion resistance was shown by specimens brazed with zinc base solders, increasing with a higher Zn content, which also improved their bond with the brazed Al alloys. A higher Zn content raises however the melting temperature of stannous solders and their crystallization and hot brittleness range which makes abrasive and ultrasonic brazing most difficult. The liquid-solid range can be reduced by adding to the alloys with 35 - 39% Zn small cadmium and bismuth admixtures (about 0.2% each), to prevent hot brittleness and make them fluid at 250 - 260°C. S. V., Lashko-Avakyan, N. F. Lashko and B. V. Nikolayev suggested corrosion resistant tin-base alloy 250 (VP250A) of the following composition: 35 - 39% Zn; 0.4% Cu; 0.2 - 0.3% Cd; 0.2 - 0.3% Sb. Abrasive brazing with this solder can be made at 210 - 260°C, ultrasonic brazing at 250 - 260°C. High corrosion resistance is offered by joints

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Corrosion resistance of aluminum alloy...

brazed with Zn-Al base solders and aluminum alloys brazed with some zinc-base solders: ПСр 5АКТс (PSr5AKTs) (5% Ag, 2% Al, up to 0.15% Si) and ПАКТс (PAKTs) (20% Al; 0.15% Si) with flux removal after brazing. Crevice corrosion revealed in AMts alloy specimens brazed with PAKTs solder was due to frontal galvanic corrosion of the soldered joint. There are 6 tables, 2 figures and 8 references: 5 Soviet and 3 non-Soviet.

Table 1:

No. of solder	Composition of tin base solders in %						
	Pb	Sb	Cd	Zn	Cu	Al	Sn
1	20	-	-	-	-	-	80
2	-	-	-	10	-	-	90
3	-	-	10	-	-	-	10
4	-	-	-	-	5	-	95
5	-	6	-	-	-	-	94
6	20	-	10	-	-	-	70
7	-	-	10	10	-	-	80

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Corrosion resistance of aluminum alloy...

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Table 1 continued:

10	-	6	-	20	-	-	74
11	-	6	10	20	-	-	64
13	15	-	7	-	-	-	74
15	51	-	9	9	-	-	31
29	-	-	-	95	-	5	-
30	-	-	-	97.5	-	2.5	-
31	-	-	-	40	-	60	-
32	-	-	-	100	-	-	-
33	-	-	-	-	-	-	100

X

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22941
S/125/61/000/006/005/010
D040/D112

AUTHORS: Lashko, N. F., Lashko-Avakyan, S. V. (Moscow)

TITLE: Crystallization cracks in welding

PERIODICAL: Avtomaticheskaya svarka, no. 6, 1961, 37-46

TEXT: Available data on cracking in fusion welding are examined and some theories disproved, in particular the theory by B. A. Movchan (Ref.5 and 15: "Avtom. svarka", no. 6, 1959; "Izvestiya AN SSSR. Metallurgiya i toplivo", no. 5, 1959; and DAN SSSR, vol 120, no. 3, 1958). Movchan's theory concerned crack formation in single-phase austenite steel welds. Its essence: cracks form on crystallites boundaries in solid state, spread to the crystallization front and are filled with liquid metal from the welding pool. The authors consider this case possible but just as a particular and even rare case, and prove that boundaries between joining crystallites forming during crystallization may or may not pass along the segregation spaces between growing dendrites (Fig. 2) and can sometimes be revealed only owing to different susceptibility to etching in adjacent grains. An example is aluminum with 1.5 and 2.5% Cu studied by the authors, where the crystallite boundaries had

X

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Crystallization cracks in welding

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the form of thin, clear lines (Fig. 5), probably due to a higher content of Cu and impurities in them. In aluminum with more Cu (3.5 and 5.8%) the structure became polyhedral, no fine boundary lines or segregation spots were visible and cracking susceptibility was reduced. The crystallization of stannum and several steel grades is discussed and illustrated by photomicrographs proving that grain boundaries can be located differently. It is pointed out that crystallization cracks may form between dendrite axes and not on the boundaries. This is evident in welds made on cast weldable ВЛ 7-20 (VL7-20) steel (Fig. 9) by austenitic X20H10Г6А (Kh20N10G6A) steel electrodes. Cracks started in it on the crystallite boundaries and spread into the interaxial segregation area within the crystallite, and the crack came out to the fusion line between the weld and base metal and penetrated only where it met low-melting interaxial dendrite areas. Cracks that did not cross the fusion line did not spread into base metal. Cracks spread along boundaries that did cross segregation areas as well as along those that did not cross it (Fig. 10). It is advised to avoid welds with clear crystallite boundaries not coinciding with segregation areas, particularly when carbides, sulfides and other compounds are segregating on the boundaries. Austenitic alloys being welded must contain as little carbon, sulfur, phosphorus, silicon or other matters

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Crystallization cracks in welding

that reduce the crack resistance as possible, or else they must be alloyed with elements reducing segregation, i.e. titanium, columbium, manganese. Boron has a very complex effect, i.e. forms borides, dissolves in only very low quantities. In austenitic steel with low boron content the cracking can be suppressed either by reducing the boron content in welds below its solubility point by using a boron-free filler alloy, or binding boron into high-melting eutectics. Molybdenum and tungsten are such binding elements, and the $(Cr,Mo)_5B_4$ and $(Cr,W)_5B_4$ boride compounds are high-melting. The authors consider tungsten more effective than molybdenum, for it raises the iron melting point and concentrates in the dendrite axes, whilst molybdenum slightly lowers the iron melting point and concentrates mainly in interaxial spaces. No crystallite boundaries were observed in welds in austenite steel produced by the most suitable electrodes - X 16H25M6 (Kh16H25M6) with high Mo content, and 9W-869 (EI-869) or BWC-98 (VZh-98) high W-content. In such welds the boundaries appear to be dislocations and they are only visible after heating subsequent to welding (due to diffusion of impurities or carbon into boundaries). There are 10 figures and 15 references: 13 Soviet-bloc and 2 non-Soviet bloc.

SUBMITTED: August 20, 1960

Card 3/5

22016

1.2300 also 1454, 1413, 1573

S/135/61/000/006/008/008
A006/A106

AUTHORS: Lashko, N.F., Lashko-Avakyan, S.V., Candidates of Technical Sciences

TITLE: On the problem of "hot" and crystallization cracks in welding and casting

PERIODICAL: Svarochnoye proizvodstvo, no.6, 1961, 41 - 42

TEXT: The authors discuss an article published by A.A. Bochvar, N.N. Rykalin, N.N. Prokhorov, I.I. Novikov and B.A. Movchan in the 1960 October copies of "Svarochnoye proizvodstvo" and "Liteynoye proizvodstvo", on "hot" cracks, which are identified with crystallization cracks forming during casting and welding of alloys. The authors of the present article state that the formation of hot cracks in casting and welding has not been sufficiently treated so that the purpose of the article was not fulfilled. A number of debatable points are discussed and the following concepts on the subject are presented: 1. Crystallization cracks in casting and welding are one of the varieties of "hot" cracks; they arise, as a rule, in the non-equilibrium crystallization range of alloys and may develop in solid state during cooling. Crystallization cracks include: a) those forming in the solidified portion of the alloy where the liquid phase is drawn-in

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22016

On the problem of "hot" and crystallization cracks... S/135/61/000/006/008/008
A006/A106

X

from the non-solid portion under the effect of capillary and hydrostatic forces, and b) cracks, forming after non-equilibrium solidifying of the alloy as a result of its partial fusion during heat redistribution of alloying elements by cooling. 2) Crystallization cracks may arise as a result of low macroductility of the alloy in both the liquid-solid and the solid-liquid ranges (in the "effective" crystallization range). 3) Solid crystals show considerable ductility in the crystallization range. The low macro-ductility of a liquid-solid material during its expansion in the solid-liquid range is connected with the local nature of deformation of its solid portion. The authors reject the theory that alloys in the crystallization range possess least macro-ductility, as a characteristic constant of each alloy. 4) The low ductility range (brittleness) includes not only the "effective" crystallization range. "High ductility" of alloys observed on the borders of the solid liquid and the liquid-solid state, is actually related to the stabilization of the alloy state after solidifying and redistribution of its solid portion. When determining true macro-ductility of alloys in the crystallization range phenomena connected with the shifting of the liquid phase should be prevented, in particular, after failure of specimens. 5) The brittleness range of some alloys during solidification may be below the real solidus temperature. Cracks forming in this range are considered as "hot" sub-solidus cracks. 6) Cry-

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On the problem of "hot" and crystallization cracks...

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stallization cracks may also arise during heating of the alloy as a result of its partial fusion. The limitation of conditions promoting hot crack formation merely by cooling the liquid alloy, excludes crystallization cracking in weld-adjacent areas during multi-layer and resistance welding. 7) The possibility of crystallization crack formation in the weld-adjacent zone during welding, the mixing of seam and base metal and the specific thermal effect of the base metal, create a substantial difference in the conditions of crystallization cracking during casting and welding. 8) The determination of an "effective" crystallization range from a phase diagram should be avoided, since the temperature range of the solid-liquid state of natural alloys may vary due to impurities or non-equilibrium crystallization. 9) The authors approve the statement that the evaluation of proneness to crystallization cracking may be erroneous if determined from the temperature range of brittleness, ductility in this range, or the rate of increasing elastic-plastic deformation at dropping temperatures. 10) The length and width of cracks arising during casting and welding is the simplest measure of the resistance to the formation and development of crystallization cracks. Effective methods should be used to distinguish the proneness of an alloy to crystallization cracks and its proneness to the development of cracks in solid state. The proposed quantitative determination of crystalliza-

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22016

On the problem of "hot" and crystallization cracks ... S/135/61/000/006/008/008
A006/A106

tion crack-resistance from the difference between least relative elongation in the "effective" crystallization range and the magnitude of free temperature deformation at the temperature of this minimum, is considered to be hardly applicable in practice and absolutely unsuitable for determining sensitivity of alloys to crystallization cracks in the weld-adjacent zone.

Card 4/4

LASHKO, N.F., kand.tekhn.nauk; LASHKO, S.V., kand.tekhn.nauk

Increasing the corrosion resistance of aluminum alloy
weldments made with fusible solders. Svar. proizv.

no.12:29-30 D '62.

(MIRA 15:12)

(Aluminum alloys—Corrosion)
(Solder and soldering)

PHASE I BOOK EXPLOITATION

SOV/6402

Lashko, N. F., and S. V. Lashko

Nekotoryye problemy svarivayemosti metallov (Some Problems of Metal Weldability) Moscow, Mashgiz, 1963. 299 p. Errata slip inserted. 4000 copies printed.

Reviewer: F. Ye. Tret'yakov, Candidate of Technical Sciences;
Ed. of Publishing House: L. A. Osipova; Tech. Ed.: V. D. El'kind;
Managing Ed. (for literature on hot treatment of metals): L. A. Osipova, Engineer.

PURPOSE: This book is intended for scientific workers and engineers concerned with the study of metals and alloys and the development of welding technology.

COVERAGE: The book reviews some problems of weldability of metals in fusion welding. The problem of weld quality is reviewed in conjunction with nonequilibrium crystallization, and with the degree and character of heterogeneity of the structure being

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Some Problems of (Cont.)

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formed during weld formation. General conditions leading to the formation of crystallization, subsolidus, and quench [cold] cracks are discussed. The problem of the strength, brittleness, and ductility of welded joints is reviewed in conjunction with structural transformations in the heat-affected zone. Basic problems are illustrated with examples of typical monomorphous aluminum-, copper-, and molybdenum-base alloys as well as of polymorphic titanium-base alloys. No personalities are mentioned. There are 344 references: 208 Soviet, and 136 non-Soviet.

TABLE OF CONTENTS:

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LASHKO, N.F., kand.tekhn.nauk; LASHKO, S.V., kand.tekhn.nauk

Solder activation for stainless steels. Svar. proizv. no.2:17-19
F '63. (MIRA 16:2)
(Steel, Stainless—Welding) (Solder and soldering)

AID Mr. 988-12 12 June

BRITTLE INTERLAYER IN BRAZED JOINTS (USSR)

Lashko, N. F., and S. V. Lashko. Avtomaticheskaya svarka, no. 4, Apr 1963, 34-40.

S/125/63/000/004/006/011

Factors causing the formation of a continuous brittle intermetallic layer in the brazing alloys—base-metal interface and the penetration of liquid brazing alloy into base metal along grain boundaries have been studied. Analysis of data from the literature and of the results of extensive experiments showed that such brittle layers are formed only in joints solidifying according to a peritectic reaction (both independent of and associated with a eutectic reaction) with the formation of incongruent chemical compounds and only when the solubility of the compound components in the base metal at the brazing temperature is low. Brittle interlayers are formed, for instance, when Cu-, Fe-, and Ni-base or Ag-rich brazing alloys are used for brazing Ti, Cd-base alloys, for brazing Ni; or Ni and Cu-Ni alloys, for brazing Nb. Congruent chemical compounds do not form continuous

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AID Nr. 988-12 12 June

BRITTLE INTERLAYER [Cont'd]

S/125/63/000/004/006/011

layers. Formation of the continuous brittle layers in brazed joints can be prevented by avoiding, or at least by shortening the duration of, contact between base metal and liquid brazing alloy by means of suitable in-between coatings, by brazing at the lowest possible temperature, and by a precise dosing of the brazing alloy. The last can be achieved by using the alloy in the form of thin foil or wire mesh. The intergranular penetration of the liquid phase into the base metal takes place only when the brazing alloy contains a component which forms a eutectic with the base metal, and only when this component possesses a low solubility in the base metal. Otherwise the intergranular penetration of the liquid phase into the base metal will take place only after the base metal is saturated with the alloying element, i.e., after the formation of a solid-solution layer, which will retard the penetration process.

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L 18378-63

EWP(k)/EWP(q)/EWT(m)/BDS

AFFTC/ASD

Pf-L

JD/HM

ACCESSION NR: AP3002316

S/0125/63/000/006/0030/0035

• AUTHOR: Lashko, N. F. (Moscow); Lashko, S. V. (Moscow)

66
61

TITLE: Interaction between brazing alloy and base metal. 2. Dissolution of the base metal during brazing

14

SOURCE: Avtomaticheskaya svarka, no. 6, 1963, 30-35

TOPIC TAGS: brazing, base metal erosion, precautionary measures, base metal dissolution, types of reaction, dissolution rates

ABSTRACT: In an attempt to find ways of reducing the dissolution of the base metal by the molten brazing alloy during brazing, an investigation was made of the physicochemical phenomena occurring under conditions approximating those of capillary brazing and dip brazing. In the first case, in which the volume of the brazing metal was small as compared with that of the base metal, the rate of dissolution was calculated from the depth of fusion of the base metal in fillet regions in a certain time period; in the second, it was determined by the increase in weight per unit of original surface of the specimen per unit of time after immersion in a bath of liquid brazing metal. Three basic patterns of dissolution-rate temperature were determined: 1) continuous increase (in case

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of formation of solid solutions or eutectics); 2) overall increase, but with temporary decrease within a limited range of median temperatures (when there is an excess of brazing alloy and the base metal and the brazing alloy form inter-metallic compounds); and 3) initial steady increase, with subsequent steady decrease (when there is a limited quantity of brazing alloy). Nickel brazed with copper or with nickel-beryllium or nickel-boron eutectic alloys; copper brazed with copper-phosphorus eutectic alloy; and aluminum brazed with zinc behave according to pattern 1. Pattern 2 is observed in dip brazing of copper with tin or cadmium, or nickel with cadmium; and pattern 3, in brazing VT-1 commercial-grade titanium with PSr72 [silver-base] alloy, or EI-437 [Nimonic 80A] alloy with alloys of the Ni-Cr-Mn system. The rate of dissolution of the base metal by the brazing alloy can be reduced by 1) limiting the time of contact between the liquid brazing alloy and the base metal; 2) keeping the brazing temperature as low as possible; 3) limiting the alloying of the base metal by the brazing-alloy components; 4) refraining from the use of a single, low melting metal as the brazing alloy, and using, instead, its alloys (for example, eutectic) with the base metal (such alloys flow better into the capillaries and dissolve the metal surfaces to be joined to a lesser extent); 5) brazing only those metals which form a wide range of solid solutions with the brazing alloy; and 6) carefully

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ACCESSION NR: AP3002316

measuring out the amounts of brazing alloy to be used. Orig. art. has: 5 figures.

ASSOCIATION: none

SUBMITTED: 04Apr62

DATE ACQ: 12Jul63

ENCL: 00

SUB CODE: 00

NO REF SOV: 003

OTHER: 000

Card 3/3

ACCESSION NR: AP4029383

8/0135/64/000/004/0010/0012

AUTHOR: Bogdanova, V. V. (Engineer); Iashko, S. V. (Candidate of Technical Sciences); Rozenberg, I. V. (Engineer)

TITLE: On the chemical inhomogeneity of brazed joints

SOURCE: Svarochnoye proizvodstvo, no. 4, 1964, 10-12

TOPIC TAGS: brazing, nickel brazing, aluminum brazing, brazed joint, chemical inhomogeneity

ABSTRACT: Using methods of local micro x-ray spectral analysis, the authors determined the chemical composition of brazed joints in nickel furnace brazed with copper or the eutectic alloy Ni-11% Si, and aluminum furnace brazed with the eutectic dissolution of Al-33% Cu. It was found that composition of the brazed joints changes considerably along the length and depth of the joint. It is shown that this inhomogeneity is associated with the dissolution of the base material in the brazing alloy, and with the mutual diffusion between the base material and the brazing alloy. Graphs showing the content of copper and silicon in joints brazed under various conditions are presented. The most important

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ACCESSION NR: AP4029383

parameters which affect the chemical inhomogeneity of the brazed joint are:
the temperature and duration of brazing, clearance, and volume of liquid metal
in the fillet portion of the joint.

ASSOCIATION: none

SUBMITTED: 00

ENCL: 00

SUB CODE: NM

NO REF SOV: 005

OTHER: 000

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L 7030-65 EWT(m)/I/EWP(k)/ERP(q)/EWP(b) Pf-4/Pad ASD(m)-3 MJW/JD/HM/HM

ACCESSION NR: AP4043915

S/0136/64/000/008/0086/0090

AUTHOR: Lashko, N. F.; Lashko, S. V.

TITLE: Diffusion brazing of nonferrous metals and alloys

SOURCE: Tsvetny*ys metalliya*, no. 8, 1964, 86-90

TOPIC TAGS: brazing, nonferrous metal brazing, nonferrous alloy brazing, diffusion brazing, refractory metal brazing, heat resistant alloy brazing, activation brazing, high temperature brazing

ABSTRACT: Diffusion brazing differs from other types of capillary brazing by a different mode of solidification. In diffusion brazing, the joint solidifies without cooling at temperatures higher than solidus temperature of the brazing alloy used. Evaporation of some components of the brazing alloy at their diffusion into base metal or the diffusion of some base metal components into the brazing alloy raises the melting point of the resulting alloy above the brazing temperature, which causes the joint solidification. High temperatures of the diffusion brazing accelerate diffusion and greatly reduce the

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ACCESSION NR: AP4043915

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magnitude of clamping pressure required. In diffusion brazing with a brazing alloy which forms brittle intermetallic compounds with the base metal, the formation of such compounds can be presented by brazing at temperatures higher than the melting point of the intermetallic compound or compounds in question. For instance nickel can be brazed with copper or nickel-silicon eutectic at 1200C. The resulting joints have a strength higher than that of nickel and a remelting temperature of 1290C. Brazing of the VT1 titanium alloy sheets with nickel (vacuum vapor deposited) on the areas to be brazed at 950C resulted in a formation of a brittle interlayer consisting of the NiTi₂ compound. Diffusion brazing at 1050C produced a complete dissolution of the compound and raised the joint strength to 35 kg/mm² and the joint remelting temperature to over 1290C. Similar results were obtained in diffusion brazing of VT1 sheets with copper when joint strength as high as 50—60 kg/mm² was reached. Diffusion brazing can be activated by using a brazing alloy (in powder form) consisting of powders and a low-melting eutectic of the base metal and some element forming solid solutions with the latter. Orig. art. has: 3 figures and 2 tables.

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ACCESSION NR: AP4043915

ASSOCIATION: None

SUBMITTED: 00

ATD PRESS: 3103

ENCL: 00

SUB CODE: MM, IE

NO REF SOV: 005

OTHER: 005

Card 3/3

LASHKOV, A.

La shkov, A. "The levelment of auto-tie welding at the metal-construction plant",
Trudy po avtomat. svarke po fil'mu (in-t elektrosvarki in. patena), Collection 2,
1948, p. 75-76.

So: U-3261, 10 April 53, (Letopis 'Zhurnal 'nykh Statey, No. 12, 1949).

LASHKOV, A.A.

Carding-Machines

New driving device for the head comb of a carding machine, Tekst. Prom., No. 1, 1952

MONTHLY LIST OF RUSSIAN ACCESSIONS. Library of Congress, March 1952. UNCLASSIFIED.

LASHKOV, A. D.

USSR/Engineering - Structural technology

Card : 1/1 Pub. 106 - 3/9

Authors : Belyaev, B. I. and Lashkov, A. D., Engineers

Title : Technological characteristics in preparing steel structures for the large culture and science building in Warsaw, Poland

Periodical : Stroi. prom. 7, 13 - 18, July 1953

Abstract : Technological data are presented on the manufacture and assembly of various steel structures for the culture and science building in Warsaw, Poland. Illustrations, drawings; diagrams.

Institution : ...

Submitted : ...

LASHKOV, A.D., inzhener; TSAL'MAN, L.B., inzhener.

Manufacturing bent steel shapes. Stroi. prom. 35 no.1:27-30
Ja '57. (MLRA 10:2)

(Sheet-metal work)

LASHKOV, A.D.

Ways of increasing the labor productivity in plants finishing
semimanufactured metal construction elements. Mat.po stal'.
konstr. no.5:165-173 '59. (MIRA 13:8)
(Steel, Structural)
(Labor productivity)

STARODUBOV, K.F., akademik; BORKOVSKIY, Yu.Z., inzh.; LASHKOV, A.D., inzh.;
TSAL'MAN, L.B., inzh.

Ways of reducing steel consumption in the manufacture of large-
diameter pipes for main pipelines. Trudy Inst.chern.met.AN URSSR
no.14:60-65 '61. (MIRA 14:10)

1. Akademiya nauk USSR (for Starodubov).
(Sheet steel) (Pipe mills)

TOLMACHEV, A.I.; LYUBARSKIY, L.V.; LASHKOV, A.I.

Publication of materials of a conference on problems of developing
forestry and the forest industry in the Far East. Bot.zhur.41 no.1:
158-160 Ja '56. (MLRA 9:6)

1.Sakhalinskiy filial Akademii nauk SSSR.
(Soviet Far East--Forests and forestry)

Lashkov, A.I.

RUSSIAN BOOK REFERENCE 807/253

RUSSIAN. Technical'nyy aero-gidrodinamicheskiy ustroystvo
Dneprovskiy (Noise Suppressor) Moscow, Gostizdat, 1959. 128 p.
(Series: Tekhnicheskaya aerodinamika, sbornik, no. 3) Extra slip
inserted. 1,100 copies printed.

By (title page): Ye. Ye. Yudin; Ed. (Russian book): A. S. Gerasimov,
Candidate of Technical Sciences; Ed. of Publishing House: Ye. A.
Yudin; Tech. Ed.: Ye. A. Pavlovskiy; Managing Ed.: A. S.
Zayarnitskiy, Engineer.

NOTE: This collection of articles is intended for engineers, technicians,
and scientific workers specializing in the field of aerodynamics and
noise suppression of aerodynamic installations.

CONTENTS: The collection contains papers on problems associated with noise
suppression of aerodynamic installations. The subjects covered include:
the basic parameters of noise suppressors, jet noise, the aerodynamic
noise of rotating rods, noise suppressors for large ventilating systems,
and methods used in acoustical research. No personalities are mentioned.
All articles but one are accompanied by references most of which are
Soviet.

1. Gerasimov, A. S., Ye. A. Gerasimov, and Ye. Ye. Yudin. Investigation
of the Effect of Density of the Medium on the Level and Spectrum
of the Aerodynamic Noise of Rotating Rods 22
2. Pavlovskiy, Ye. A. Investigation of Noise Suppressors for Large Ven-
tilating Installations 33
3. Yudin, Ye. Ye., Ye. A. Gerasimov, and A. S. Gerasimov. Natural Suppressor With
Semi-elliptical-Type Nozzles 45
4. Yudin, Ye. Ye., and A. S. Gerasimov. Investigation of Several Flow
Direction Suppressors for Supersonic 65
5. Gerasimov, Ye. A. Some Methods for Investigating Sound-Absorbing Me-
terials 80
6. Gerasimov, Ye. A. Acoustic Properties of Glass Wool 99
7. Yudin, Ye. Ye., and Ye. A. Gerasimov. Investigations on Reducing
Aerodynamic Noise 109

AVAILABILITY: Library of Congress
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AD/ma/oc
8-5-60

27852
S/508/60/029/000/010/012
D225/D303

26.2162

AUTHOR: Lashkov, A.I. (Moscow)

TITLE: The flow of a gas with local narrowing of current,
under pre-critical and post-critical conditions

PERIODICAL: Akademiya nauk SSSR. Inzhenernyy sbornik, v. 29,
1960, 106-118

TEXT: The aim of the paper is to find the physical phenomena taking place in currents of gas, compressed by sudden narrowing in the channel. It is proved that the theoretical results for two-dimensional incompressible motion of fluid in channels with sudden narrowing, comply closely with experimental data, even when the currents differ considerably from the two-dimensional type. For example, for the outflow of fluids from narrow slits and packings immersed in fluid, coefficients of non-compression are given by $\alpha_{\text{non-comp}} = \frac{\pi}{2+\pi} = 0.61$, $\alpha_{\text{non-comp}} = 0.5$ (Figs. 1 and 2). Using the results of S.A. Chaplygin (Ref. 6: Sobr.soch. Card 1/9

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The flow of a gas ...

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v. 2, 1948), it could be expressed by

$$\alpha_{\text{comp}} = \alpha_{\text{non-comp}} (1 + 0,25 M_1^2 + 0,025 M_1^4 + \dots) \quad (4)$$

Where $M_1 = \frac{w_1}{\alpha_1}$ and w_1 is a velocity at the compressed section of stream. A more general case is then considered: The outflow of gases from orifices with sharp edges, where the velocity of flow before the orifice cannot be neglected. The equation of motion in this case has the form

$$(p - p_1)F = \rho_1 w_1^2 f' - \rho_0 w_0^2 F - mw \quad (5)$$

and the coefficient of compresses is given by

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$$\alpha_{\chi \text{ comp}} = \alpha_{\text{comp}} + c \quad (7)$$

where

$$c = \frac{1}{\rho_1 w_1^2} \left(\frac{\rho_0 w_0^2}{2} + \frac{mw}{F} \right)$$

Neglecting the terms of higher order in (4) one obtains

$$\alpha_{\chi \text{ comp}} = \alpha_{\chi \text{ non-comp}} + \frac{M_1^2}{8} + \frac{M_1^4}{80} \quad (9)$$

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Comparing this with the formula of S.H. Chaplygin, the difference did not exceed 1.5%. For the critical and post-critical flow through the suddenly narrowing channel, the reaction $R=p_0(F_0-F_1)$ is assumed, where F_0, F_1 are the surfaces of the large and narrow channels. This equation¹ could be transformed into

$$z(\lambda_2) = z(\lambda_0) - \frac{1.575}{q(\lambda_0)} \left(1 - \frac{F}{F_0}\right) \quad (11)$$

which has two solutions - one corresponding to subsonic and the second one to supersonic flow. The author proved that for $F_0 F_1 = \text{const.}$ only the second case of supersonic flow could be realized. It is assumed that the supersonic flow is adiabatic. For $\lambda_{0ad} = \lambda_{0non ad.}$ the supersonic flow remains again unique, but the

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The flow of a gas...

maximum velocity for non-adiabatic flow will be less than the velocity for adiabatic, or $\lambda_{2ad} > \lambda_{2non-ad}$. These results are confirmed by the spectra of flow obtained by Tepler's method. It shows, therefore, that the process of transition to supersonic flow is a non-adiabatic one. Since the peculiarities of the flow at post-critical conditions ($p/p_0 < p_x/p_0$) are not treated in technical literature, the author describes them more exactly. In the first approximation it is assumed that: 1) At the maximum compressed cross-section of the flow, the mean pressure p_{mean} equals the critical pressure $p_m = p_x$ and the mean velocity equals the sonic velocity. 2) Pressure on the stripping line has a jump. The coefficient of compression is determined by the ratio of the pressure p in the detachment region and the total pressure p_0 of the calming camera. Assuming also one dimensional scheme for such a flow, the equation takes the form

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$$-\Delta R - p_0 (F_0 - F_1) + p_0 F_* - p(F_1 - F_*) = \rho_* a_*^2 F_* - \rho w^2 F_0 \quad (13)$$

where ΔR - component of channel's reaction. From formula (13) the coefficient of compression $\alpha_x = \frac{F_x}{F}$ is obtained,

$$\alpha_{\text{comp}} = \frac{1 + \Delta \bar{R} + 0.742 \lambda_0 q(\lambda_0) \frac{F_0}{F} - \frac{p}{p_0}}{1.27 - \frac{p}{p_0}} \quad (14)$$

where $\Delta \bar{R} = \frac{R}{p_0 F}$. The widths of the compressed cross-section of the flow are measured from photographs of spectra of the flow and subsequently the coefficient of compression is measured for two

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S/508/60/029/000/010/012
D225/D303

conditions of the flow 1) critical $p/p_0 = 0.528$ 2) post critical $p/p_0 \leq 0.35$. Their values were given in tabulated form. There are 3 figures and 10 references: 4 Soviet-bloc and 6 non-Soviet-bloc. The references to the English-language publications read as follows: S. McJohn Nowh En Hsu, Application of conformal mapping to dividant flow, 1951; Hunter Rouse a. Abdel-Hadi Abul Fetouh, Characteristics of flow through axially symmetrical orifices. Journ. of Applied Mechanics, no. 4, 1950.

SUBMITTED: April 20, 1959

Card 7/9

39935

S/258/62/002/001/001/013

1028/1228

26.2111

AUTHOR: Lashkov, A. I. and Nikol'skiy, A. A. (Moscow)

TITLE: Wave start-up of a supersonic diffuser

PERIODICAL: Inzhenernyy zhurnal, v. 2, no. 1, 1962, 11-16

TEXT: A method is described for starting-up a supersonic diffuser in its optimal range without the need of regulation. The experiments were conducted on a short action supersonic aerodynamic tube with rectangular nozzle of critical section $5\text{mm} \times 30\text{mm}$. Three interchangeable diffusers were used, with ratios of throttle area to the maximum nozzle area $h = 0.57; 0.415; 0.31$ respectively. The area of the working section was $19.3\text{mm} \times 30\text{mm}$, and the value of M (calculated for air) at the end of the nozzle, was 2.905. A diaphragm was placed in the critical section of the nozzle. A vacuum was created in the supersonic part of the nozzle and the diffuser, while the subsonic part was filled with gas. The pressure of the gas was increased gradually until the diaphragm burst. This produced a non-stationary supersonic gas flow, which stabilized in a short time into the necessary design stationary supersonic flow. The gas first used was air, which, however, was found unsatisfactory and replaced by nitrogen. The experiments permit a start-up of optimum supersonic diffusers and their steady operation during the time of operation as designed for the installation; this was achieved with throat areas considerably smaller ($h = 0.57$ as against $h = 0.72$) than in diffusers started up in the usual way. There are 9 figures.

Card 1/2

Wave start-up...

S/258/62/002/001/001/013
I028/I228

ASSOCIATION: Institut mekhaniki AN SSSR (Institut of Mechanics AS USSR)

SUBMITTED: November 30, 1961

Card 2/2

S/258/62/002/002/013/018
1028/1228

AUTHOR: Lashkov, A. I. (Moscow)

TITLE: On the resistance crisis of the diffuser

PERIODICAL: Inzhenernyy zhurnal, v. 2, no. 2, 1962, 265-368

TEXT: The dependence of the resistance ρ on Re in diffusers with large divergence angle is discussed. An analogy is indicated between the structural flow changes taking place in the flow in a diffuser and in the flow past a sphere, a cylinder, etc., with the increase of Re . The existence of this analogy is corroborated by a repetition of Prandtl's experiment. Experimental curves of ρ for a diffuser of 24° divergence angle, and of C_x for a cylinder, are established as a function of Re ; it is established that the introduction of a turbulizer affects similarly the curves in both cases. A resistance crisis is detected in the diffuser when a turbulizing wire ring is placed in it. The onset of the resistance crisis is found to depend on the roughness of the diffuser walls. There are 7 figures.

ASSOCIATION: Institut mekhaniki AN SSSR (Institute of Mechanics AS USSR)

SUBMITTED: January 29, 1962

Card 1/1

LASHKOV, A.I. (Moskva)

Equation of three velocities for a shock pipe. Inzh.zhur. 2
no.3:161-162 '62. (MIRA 15:8)

1. Institut mekhaniki AN SSSR.
(Pipe--Hydrodynamics)

LASHKOV, A. I.,

"Interaction of a Reflected Shock Wave and Boundary Layer"

report presented at the Sixth Symposium on Advanced Problems in Fluid Mechanics,
Zakopane, Poland, 2-6 Sep 63

ANDREYEV, V.A. (Moskva); LASHKOV, A.I. (Moskva)

Interaction of a reflected shock wave with a boundary layer.

Inzh.zhur. 3 no.4:706-710 '63.

(MIRA 16:12)

1. Institut mekhaniki AN SSSR.

D 8949-65
AFTC(p)

EWT(1)/EPA(b)/EMC(v)/FCS(k)/EWA(1)

Pd-4/Pe-5/Pi-4 AEDC(a)/

ACCESSION NR: AP4043532

S/0258/64/004/003/0551/0553

AUTHOR: Lashkov, A. I.

B

TITLE: Effect of compressibility on the resistance of exhaust diffusers

SOURCE: Inzhenernyy zhurnal, v. 4, no. 3, 1964, 551-553

TOPIC TAGS: exhaust diffuser, hydraulic resistance, hydraulic resistance coefficient

ABSTRACT: Experimental data are presented on the dependence of the hydraulic resistance of conical subsonic exhaust diffusers on the Mach and Reynolds numbers. The studies were carried out in an experimental unit with a damping chamber in which the flow from an axial compressor is slowed down and evenly distributed in the chamber space by nozzle grids. Data on the pressure difference in the damping chamber and in the atmosphere, $\Delta P_0 = P_0 - P$, and on the average pressure head $P_w^2/2$, calculated from the pressure difference between the damping chamber and the nozzle, $\Delta P_k = P_0 - P_1$, were used to calculate the hydraulic-resistance coefficient of the exhaust diffuser ($\xi = 2(P_0 - P_1)/P_w^2$). Both air (with M ranging from zero to 1 and $d = 40, 90$, or 350 mm) and water were used in the experiments. It is shown that at values of M ranging from zero to 0.9, the hydraulic resistance

Card 1/2

L 89h9-65

ACCESSION NR: AP4043532

coefficient is independent of the compressibility but is markedly dependent on
Re $< 0.17 \times 10^6$. Orig. art. has: 5 figures.

ASSOCIATION: Institut mekhaniki AN SSSR (Institute of Mechanics, AN SSSR)

SUBMITTED: 14 Nov 62

AND PRESS: 3105

ENCL: 00

SUB CODE: ME, FR

NO REF SOV: 003

OTHER: 000

Cord 2/2

L 12131-65 EWT(1)/ENP(m)/EWA(d)/EPR/FCS(k)/EWA(h)/EWA(c)/EWA(1) Pd-1/Pl-4 WW
ACCESSION NR: AP5011319 UR/0258/65/005/002/0254/0260

AUTHOR: Lashkov, A. I. (Moscow)

TITLE: On regularity of inviscid gas flow in a shock tube

SOURCE: Inzhenernyy zhurnal, v. 5, no. 2, 1965, 254-260

TOPIC TAGS: shock tube, viscous gas flow, shock wave, incident shock wave, shock wave attenuation, flow behind shock wave, electron beam technique, contact surface

ABSTRACT: A viscous gas flow behind a shock wave in a shock tube characterized by acceleration of the contact surface with simultaneous attenuation of the shock wave is investigated by using an electron beam technique. In this case, the measured distance l between the shock wave and the contact surface diminishes substantially in comparison with calculated values obtained through ideal gas theory. The experimental setup (see Fig. 1. of the Enclosure) and procedures are described. Two parameters characterizing the incident shock wave and flow behind it were measured: the ratio of densities in a shock wave ρ_2/ρ_1 and the duration of uniform flow τ between the arrival

Card 1/43

L 42131-65

ACCESSION NR: AP5011319

of the shock wave and the contact surface. A comparison of the measured and theoretical values of the velocity of the incident shock wave calculated from measured values of ρ_2/ρ_1 shows that the maximum discrepancy does not exceed 10% of the absolute value. Flow parameters measured and calculated for argon and air are given in tabular form. Graphs of τ and λ as functions of M_1 and Re are plotted for air, helium, and hydrogen, with argon used as the driver gas. An analysis of the results obtained by the author and those of R. E. Duff shows that: 1) the relative distance λ (or the duration of uniform flow) in a shock tube is determined by Re and not by M_1 when $Re \leq 4000$; 2) there exist flow regimes in air at $Re \leq 600$ and in argon at $Re \leq 1200$ at which the distance λ is independent of shock tube length; and 3) while comparing two absolutely similar flow regimes in shock tubes of different diameters at $Re \leq 4000$, the absolute value of λ is proportional to the square of the diameter: $\lambda \propto D^2$. The attenuation of the shock wave is evaluated by using the experimental relationship $\rho_2/\rho_1 = f(M_1)$ given in a graph for air, hydrogen and helium. Orig. art. has: 6 figures, 2 tables and 3 formulas. [AB]

Card 2/4

L 42131-65

ACCESSION NR: AP5011319

ASSOCIATION: none

SUBMITTED: 27Jan64

ENCL: 01

SUB CODE: ME

NO REF SOV: 001

OTHER: 009

ATD PRESS: 3239

Card 3/4

L 16519-66 EWT(1)/EWP(m)/EWA(d)/EWA(h) LIP(c) WW/AT

ACC NR: AP6002627

SOURCE CODE: UR/0258/65/005/006/1114/1117

AUTHOR: Lashkov, A. I. (Moscow)

ORG: none

TITLE: Investigation of the zone behind a reflected shock wave by means of an electron beam

SOURCE: Inzhenernyy zhurnal, v. 5, no. 6, 1965, 1114-1117

TOPIC TAGS: reflected shock wave, electron beam, experimental method, boundary layer/ OK-17 oscillograph, MGI-1 oscillograph, IAB-451 illuminator

ABSTRACT: The zone behind a reflected shock wave in a special shock tube was investigated by means of an electron beam. A 10 x 10 by 1030 mm long shock tube was used. The electron beam was generated from a tungsten cathode with an effective potential of 18 kv. The driver gases were nitrogen, helium, and hydrogen. The driven gas was air. The relative density in the reflected shock zone was measured by the intensity ratio according to the formula

$$\frac{p_2}{p_1} = \frac{\ln I_1 / I_2}{\ln I_0 / I_1} + 1$$

Card 1/2

UDC: 533.6.011.72

L 16519-66

ACC NR: AP6002627

The results show the growth of a boundary layer behind the reflected shock and auxiliary shock generated by the interaction of the shock wave with the boundary layer (see, for example, Fig. 1). Oscillogram plots are given to show the density

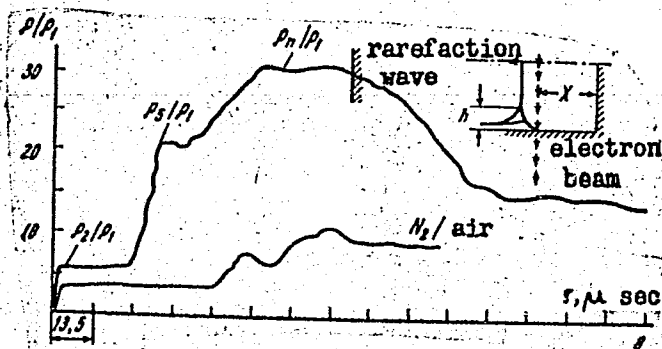


Fig. 1.

rise behind the reflected shock as well as the shock-boundary layer interaction zone. Orig. art. has: 6 figures, 3 formulas, and 1 table.

SUB CODE: 20/

SUBM DATE: 31May65/

ORIG REF: 002/

OTH REF: 002

Card 2/2 *TS*

LASHKOV, A. N.

PA 51T24

USSR/Geography
Soil Science

Jan/Feb 1948

"Soil Morphology of the South Kuriles," A. N. Lashkov,
8 pp

"Izv Vsesoyuz Geograf Obsh" Vol LXXX, No 1

Reports results of expedition by the Primorskiy Affiliate of the All-Union Geographic Society and the Far Eastern Base of the Academy of Sciences to collect new factual data to compile physico-geographic outline of the Kuriles. Evaluates various factors influencing in some degree the course of soil formation, and presents some quantitative material.

51T24

1. LASHKOV, A. N.
2. USSR (600)
4. Kuril Islands - Forests and Forestry
7. Forests of the Kuril chain and their significance. Izv. Vses. geog. ob-va 79, No. 4, 1947.

9. Monthly List of Russian Accessions, Library of Congress, May 1953, Uncl.

LASHKOV, A.N.

USSR / Forestry. Forest Cultures.

K

Abs Jour: Ref Zhur-Biol., No 7, 1958, 29578.

Author : Lashkov, A. N.

Inst : ~~Far Eastern~~ Scientific Research Institute for Forestry.

Title : An Experiment in the Artificial Cultivation of the Korean Cedar on Sakhalin Island.
(Opyt iskusstvennogo razvedeniya kedra koreyskogo na Sakhaline).

Orig Pub: Byul. nauchno-tekhn. inform. Dal'nevost. n.-i. in-ta lesn. kh-va, 1957, No 3, 28-31.

Abstract: No abstract.

Card 1/1

61

LASHKOV, A.N.

Track maintenance on rapid transit sections. Put' i put.khoz. 4
no.8:3-7 Ag '60. (MIRA 13:7)

1. Nachal'nik distant'sii puti stantsii Bologoye, Oktyabr'skoy dorogi.
(Railroads--Track)

SHABALIN, Georgiy Ivanovich; ANDREYEV, Georgiy Yefimovich; BOGDANOVA,
Mariya Konstantinovna; LASHKOV, Aleksandr Nikolayevich;
YERSHKOV, O.P., kand. tekhn. nauk, retsenzent; SERGEYEVA,
A.I., inzh., red.; VOROB'YEVA, L.V., tekhn. red.

[The track on high-speed train sections; work practice of the
railroad workers of the October Railroad] Put' na uchastkakh
skorostnogo dvizheniya poezdov; opyt raboty puteitsev Oktiabr'-
skoi dorogi. Moskva, Transzheldorizdat, 1962. 71 p.

(MIRA 15:10)

(Railroads--Track)

LASHKOV, Anatoliy Stepanovich; MIKHAYLOV, I.G., red.; FREGER, D.P.,
red.1zd-va; BELOGUROVA, I.A., tekhn. red.

[Ultrasonic investigation of the cavitation of hydraulic
machinery] Ul'trazvukovoi metod issledovaniia kavitatsii
gidravlicheskikh mashin; stenogramma lektsii. Leningrad,
1963. 32 p. (MIRA 16:10)

(Hydraulic machinery--Testing) (Cavitation)
(Ultrasonic waves--Industrial applications)

LASHKOV, Anatoliy Stepanovich; POLUSHKIN, Nikolay Petrovich; BOZHKO-
STEPANENKO, G.M., inzh., red.; SOKOLOV, D.A., red.; VELITSYN,
V.I., tekhn. red.

[Results obtained from testing hydraulic units of hydroelectric
power stations in dams] Nekotorye rezul'taty ispytaniy gidroagrega-
tov priplotinnykh gidroelektrostantsii. Moskva, Orgenergostroi,
1959. 58 p. (MIRA 14:6)

(Hydroelectric power stations)

LASHKOV, A.S., inzh.

Studies of cavitation in operational hydraulic turbines and
their models. Elek. sta. 35 no.2:37-41 F '64.
(MIRA 17:6)

LASHKOV, B.I., inzh.

"Reka" echo depth sounder used in river navigation. Rech.transp. 17
no.10:47-49 0 '58.
(Sonar) (Inland navigation) (MIRA 11:12)

SHCHEPERIN, G.M.; VETROV, A.G.; LASHKOV, B.P.

Experience in using aerial photographic survey materials
for the zoning of areas according to conditions under which
prospecting is to be conducted. Vop. rud. geofiz. no.5:
68-75 '65. (MIRA 18:9)

LASHKOV, B.P.; SOMOV, G.M.

Example of a rapid mapping of loose sediments and the
determination of their thickness. Vop.razved.geofiz.
no.4:51-53 '64.

(MIRA 19:1)

ALEKSEYEVA, G.Ye., kand. tekhn. nauk, dots.; MELESHKINA, L.P., dots., kand. tekhn. nauk; BALUYEV, V.K., inzh.; BANDAS, A.M., prof., doktor tekhn. nauk; VENIKOV, V.A., prof., doktor tekhn. nauk; YEZHKOVA, V.V., kand. tekhn. nauk; ANISIMOVA, N.D., dots., kand. tekhn. nauk; GANTMAN, S.A., kand. khim. nauk; GLAZUNOV, A.A., dots., kand. tekhn. nauk; GOGUA, L.K., inzh.; GREBENNICHENKO, V.T., inzh.; GRUDINSKIY, P.G., prof.; GORFINKEL', Ya.M., inzh.; ZVEZDIN, A.L., inzh.; KAZANOVICH, G.Ya., inzh.; KNYAZEVSKIY, B.A., dots., kand. tekhn. nauk; KOSAREV, G.V., dots., kand. tekhn. nauk; MESSERMAN, S.M., kand. tekhn. nauk, dots.; KOKHAN, N.D., inzh.; KUVAYEVA, A.P., dots., kand. tekhn. nauk; SOKOLOV, M.M., dots., kand. tekhn. nauk; LASHKOV, F.P., dots., kand. tekhn. nauk; LAZIN, A.I., inzh.; YUDIN, F.I., inzh.; LIVSHITS, A.L., kand. tekhn. nauk; METEL'TSIN, P.G., inzh.; NEKRASOVA, N.M., dots., kand. tekhn. nauk; OL'SHANSKIY, N.A., dots., kand. tekhn. nauk; POLEVAYA, I.V., dots., kand. tekhn. nauk; POLEVOY, V.A., dots., kand. tekhn. nauk [deceased]; RAZEVIK, D.V., prof., doktor tekhn. nauk; RAKOVICH, I.I., inzh.; SOLDATKINA, L.A., dots., kand. tekhn. nauk; TREMBACH, V.V., dots., kand. tekhn. nauk; FEDOROV, A.A., prof., kand. tekhn. nauk; FINGER, L.M., inzh.; CHILIKIN, M.G., prof., doktor tekhn. nauk, glav. red.; ANTIK, I.V., inzh., red. GOLOVAN, A.T., prof., red.; PETROV, G.N., prof., red.; FEDOSEYEV, A.M., prof., red.

(Continued on next card)

ALEKSEYEVA, G.Ye.--- (continued). Card 2.

[Electrical engineering manual] Elektrotekhnicheskii
spravochnik. Pod obshchei red. A.T. Golovana i dr. Moskva,
Energiia. Vol.2. 1964. 758 p. (MIRA 17:12)

1. ~~Moscow~~. Energeticheskii institut. 2. Moskovskiy energo-
ticheskii institut (for Golovan, Grudinskiy, Petrov,
Fedoseyev, Chilikin, Venikov). 3. Chlen-korrespondent AN
SSR (for Petrov).

GUSEV, S.A., inzh.; ZHUKHOVITSKIY, B.Ya., kand.tekhn.nauk; ZARIN, D.D.,
 kand.tekhn.nauk; IVANOV-SMOLENSKIY, A.V., kand.tekhn.nauk;
 KNYAZEVSKIY, B.A., kand.tekhn.nauk; KUZNETSOV, A.I., inzh.;
 KOZIS, V.L., kand.tekhn.nauk; KORYTIN, A.A., inzh.; LASHKOV,
 F.P., inzh.; L'VOV, Ye.L., kand.tekhn.nauk; MELESHKINA, L.P.,
 kand.tekhn.nauk; NEKRASOVA, N.M., kand.tekhn.nauk; NIKULIN,
 N.V., kand.tekhn.nauk; POLEVOY, V.A., kand.tekhnicheskikh
 nauk; RAZEVIK, D.V., kand.tekhn.nauk; ROZANOV, G.M., kand.tekhn.
 nauk; RUMSHISKIY, L.Z., kand.fiz.-matem.nauk; SVISTOV, N.K.,
 kand.tekhn.nauk; SIROTINSKIY, Ye.L., kand.tekhn.nauk; SOKOLOV,
 M.M., kand.tekhn.nauk; TALITSKIY, A.V., prof.; TREMBACH, V.V.,
 inzh.; FEDOROV, A.A., kand.tekhn.nauk; GRUDINSKIY, P.G., prof.;
 PRYTKOV, V.T., kand.tekhn.nauk; CHILIKIN, M.G., prof., glavnyy
 red.; GOLOVAN, A.T., prof.; red.; PETROV, G.N., prof., red.;
 FEDOSEYEV, A.M., prof., red.; ANTIK, I.V., red.; SKVORTSOV, I.M.,
 tekhn.red.

[Handbook for electric engineering] Elektrotekhnicheskii spravochnik. Moskva, Gos.energ.izd-vo, 1952. 640 p. (MIRA 13:2)

1. Prepodavateli Moskovskogo energeticheskogo instituta imeni V.M. Molotova (for all except Antik, Skvortsov).
 (Electric engineering)

LASHKOV, F.P., kand.tekhn.nauk, dots.

Permissible voltage losses in local electric networks. Trudy MEI
no.26:173-187 '57. (MIRA 11:9)
(Electric networks)

LASHKOV, F.P., kand. tekhn. nauk

Use of transformers with reverse operation relays. Elek. sta.
36 no.9:89-91 S '65. (MIRA 18:9)

L 15767-66 EWT(m)/EMF(j) RM

ACC NR: AP5027679

SOURCE CODE: UR/0051/65/019/005/0821/0824

AUTHOR: Lashkov, G. I.; Shablya, A. V.

ORG: none

TITLE: Photochromatic transformations in spiropyran by luminescence

SOURCE: Optika i spektroskopiya, v. 19, no. 5, 1965, 821-824

TOPIC TAGS: computer technology, computer memory, carbon compound, photochemistry, luminescence, fluorescence, *absorption spectrum, luminescence spectrum*

ABSTRACT: J. Hirschberg (The New Scientist, 2 June 1960, The photochemical memory) mentioned spiropyran as being promising compounds for use in the memory units of computers because of their so-called photochemical memory. The photochemical transformations in 1,3,3-trimethylindoline-benzopyryliumspiran-6'-nitro-8-bromine were studied on the basis of the changes in the absorption and luminescence spectra. The absorption spectrum of spiropyran was a superposition of the spectra of at least 2 modifications of its molecule. The same conclusion based on the presence in solution at room temperature of several isomers was reached

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UDC: 535.37+541.143

L 15767-66

ACG NR: AP5027679

2

during interpretation of the spectrums of fluorescence excitation. The position of the long-wave maximum changed according to the region of the luminescence spectrum from which the recording of the excitation function was made. The sequence of isomer varieties, which formed during photocoloring, and their relative stability could be studied only under deep cooling in a rigid medium. In fact, an isomer having a long-wave absorption ($\lambda_{\text{max}} = 539 \text{ m}\mu$) and also luminescence was observed during irradiation by ultraviolet light of the discolored solutions of spiropyran cooled to 4 or 70K. A slight increase in temperature (to 83K) resulted in the formation of the next isotope according to stability having an absorption at $\lambda_{\text{max}} = 520 \text{ m}\mu$. This isomer was transformed at 90K into the other isomer having its spectral absorption maximum at $\lambda_{\text{max}} = 505 \text{ m}\mu$. The author thanks A. N. Terenina and M. V. Savost'yanova for their interest in his work. Orig. art. has:

2 figures.

SUB CODE: 09,07/ SUBM DATE: 10Apr65/ ORIG REF: 002/ OTH REF: 006

2/2

L 15563-66 EWT(m)/EWP(j)/T RM

ACC NR: AP6004409

SOURCE CODE: UR/0051/(6/020/001/0086/0091

AUTHOR: Lashkov, G. I.; Myl'nikov, V. S.

ORG: none

TITLE: Spectral analysis of luminescence and the photoconductive effect in copper phenylacetylenide polymer

SOURCE: Optika i spektroskopiya, v. 20, no. 1, 1966, 86-91

TOPIC TAGS: crystalline polymer, copper compound, photoconductivity, luminescence spectrum, light absorption, spectral distribution

ABSTRACT: Optical absorption, luminescent and photoelectric properties in copper phenylacetylenide polymer are spectrally analyzed. The photoelectric sensitivity was determined from the diffusion photoelectromotive force in a condenser with a modulation frequency of 300 cps and from the transverse d-c photoconductivity in air and in a vacuum of 10^{-5} mm Hg. Powdered specimens were used for studying the diffusion photoelectromotive force. The specimens for the photoconductivity measurements were films 1-5 μ thick. The spectral distribution of photoconductivity and

Card 1/2

UDC: 535.215 + 535.34 + 535.37 +
+ 541.65 + 541.148

L 15563-66

ACC NR: AP6004409

photoelectromotive force in the 300-700 mμ was determined by a monochromator with a diffraction grating. The light sources were a xenon lamp and a 70 watt incandescent lamp. It was found that photochemical processes in the polymer under the action of ultraviolet light reduce to dissociation of weak coordination bonds which changes the ratio between the polymer homologs. Photodestruction continues right up to formation of diphenylbutadiyne molecules which are embedded in the polymer structure. The primary event in light absorption is apparently the formation of excitons. Competition between decay and de-excitation of these particles determines the photoelectric and luminescent properties of copper phenylacetylenide. Luminescence of the polymer at low temperatures is due to radiative transitions on the surface. In conclusion we are grateful to A. N. Sidrov and Ya. S. Bobovich for measuring the infrared and Raman spectra. The authors thank A. N. Terenin for guidance in carrying out this work. Orig. art. has: 3 figures.

SUB CODE: 20/ SUBM DATE: 22Sep64/ ORIG REF: 010/ OTH REF: 011


Card 2/2